



National Aeronautics and Space Administration  
John F. Kennedy Space Center, Florida

K-ELV-10.1  
Basic  
12-1-2000

---

## **Expendable Launch Vehicles Program**

# **PROGRAM/PROJECT MANAGEMENT INSTRUCTION**

**RESPONSIBLE OFFICE: EXPENDABLE LAUNCH VEHICLE PROGRAM OFFICE**

**SUBJECT: IMPLEMENTATION OF NASA'S INSIGHT & APPROVAL ROLE  
FOR EXPENDABLE LAUNCH VEHICLE (ELV) SERVICES**

**REFERENCE:**

- (a) NPG 7120.5A - "NASA Program and Project Management Processes and Requirements"
- (b) NPD 8610.23A - "Technical Oversight of Expendable Launch Vehicle (ELV) Launch Services"
- (c) NPD 8610.24A - "Expendable Launch Vehicle (ELV) Launch Services Pre-Launch Reviews"
- (d) NPD 8610.7 - "Launch Services Risk Mitigation Policy for NASA-Owned Or NASA-Sponsored Payloads"
- (e) NASA-STD-8709.2 - "NASA Safety and Mission Assurance Roles and Responsibilities for Expendable Launch Vehicle Services"
- (f) K-ELV-10.2 - "Program Management Instruction: Launch Vehicle Qualification"
- (g) K-ELV-12.1 - "Expendable Launch Vehicle (ELV) Program Risk Management Plan"
- (h) K-ELV-xxxx - "Expendable Launch Vehicle (ELV) Launch Services Project Risk Management Plan"

## **1.0 PURPOSE AND APPLICABILITY**

This Program/Project Management Instruction (PPMI) defines the implementation by the Expendable Launch Vehicle (ELV) Program Office for the insight and approval of Expendable Launch Vehicle services as required by NPD 8610.23A, NPD 8610.24A and NASA Standard 8709.2

## **2.0 SCOPE**

In order to adequately characterize the implementation of the Insight and Approval role for Expendable Launch Vehicles this PPMI will define the applicability of Insight and Approval for all phases of ELV's support to a mission. The definition of applicability to each mission phase is required to adequately scope support for each mission. The mission phases used in this plan include: Mission Design, Integration and Engineering; Launch Vehicle Design, Production and Test; Launch Site Operations; Launch Operations; and Post Launch Activities.

## **3.0 OBJECTIVES**

The objective of the ELV Program is to assure mission success for NASA-KSC procured ELV Launch Services. Inherent in this process is the safety of the public, personnel, and high value government equipment and facilities.

## **4.0 RISK MANAGEMENT APPROACH**

In considering the level of Insight and Approval to be applied to a particular mission, the maturity, complexity and criticality of the mission will be considered.

## **5.0 DEFINITIONS**

Approval: Providing the launch service contractor authority to proceed and/or formal acceptance of requirements, plans, test, or success criteria in specified areas.

Audit: An independent review for the purpose of assessing compliance with hardware/software requirements, specifications, baselines, standards, procedures, instructions, codes, or contractual and licensing requirements. (Source: NASA HQ Safety Division Glossary of Terms – 1/25/89)

Core Vehicle: The portion of the vehicle that is essentially unchanged from mission to mission because it is unaffected by the mission unique requirements. Design changes, modifications, and upgrades to the core vehicle are typically driven by the launch service provider (LSP).

Insight: Acquiring knowledge and understanding of contractors' actions through watchful observation, documentation review, meeting attendance, reviews, tests, and compliance evaluations.

Launch Operations: Launch day activities and the management review processes that lead up to launch.

Launch Site Operations: Activities that occur at the launch site that directly affect operations with the spacecraft and/or involve testing of the launch vehicle at the launch site.

Launch Vehicle Design, Production, and Test: Manufacture and test of the entire launch vehicle for a mission, including activities associated with the actual implementation of mission unique hardware and software changes and core vehicle designs, modifications, and upgrades.

Mission Integration & Design: All activities related to accommodation of a specific spacecraft including mission unique requirements design and analyses, and leading up to, but not including, production of the mission unique hardware and software.

Mission Unique: Those hardware and software items produced uniquely for a mission. This may also include analysis and test to verify the hardware or software items and analysis to verify mission design parameters (e.g., loads, thermal, etc.).

Post Launch Activities: Activities conducted following completion of all Launch Vehicle flight events, including post-flight data review and mission success determination.

Spacecraft to Launch Vehicle Integration: The physical act of mating the spacecraft to the LV, and resulting interface tests to assure proper electrical/mechanical interfaces.

Stakeholders: Customers, including NASA Headquarters codes and spacecraft center management.

Surveillance: The continual monitoring and verification of status of an entity and analysis of records to ensure that specified requirements are being met. Note: Surveillance can be performed in an insight, oversight, or a combined mode as determined by NASA using a risk-based decision process (NPG 8735.2)

## **6.0 INSIGHT AND APPROVAL IMPLEMENTATION APPROACH**

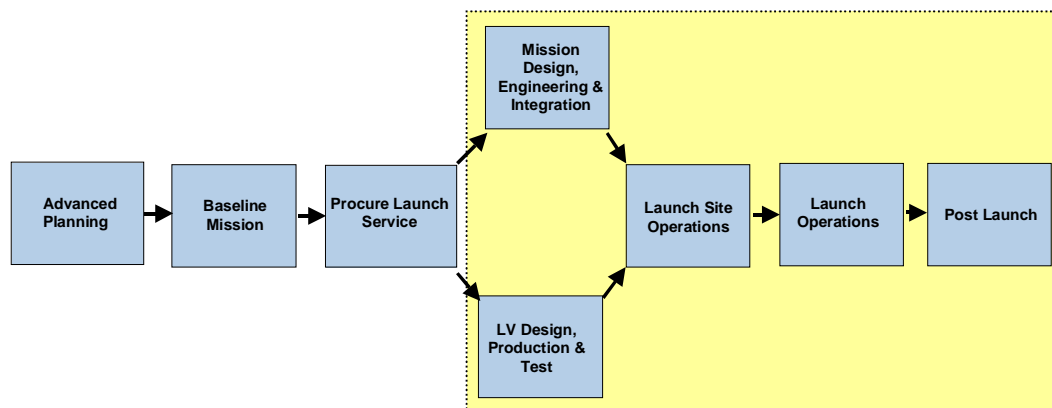
The first step in the implementation approach requires defining the applicability of Insight and Approval to the missions supported by the ELV Program.

- The requirements of Insight and Approval as defined in Appendix A of this document will be fully applied to a NASA-Procured Commercial Launch Service/Any Payload. The implementation of these requirements will vary by launch service provider.
- It is recognized that the ELV Program may be requested to support other NASA launch operations such as:
  1. USAF procured launch vehicle/NASA payload.
  2. Commercial launch service - primary payload is non-NASA and the secondary payload is NASA payload.
  3. Delivery in orbit type (turnkey) procurement of a commercial launch service.
  4. Commercial launch vehicle paid for by NASA grant/NASA sponsored payload.
  5. Foreign launch service/NASA payload.

At the request of the Spacecraft Project Manager, and with stakeholder concurrence, MOU's or Mission Plans between the Spacecraft Project and KSC will be developed to outline ELV Program and Project support to the Spacecraft Project for these situations. The MOU or Mission Plan will include a tailored set

of requirements based on Appendix A that the ELV Program and Project will support for those missions.

Figure 1 depicts the entire ELV major process flow. The shaded area in Figure 1 illustrates a standard mission flow for the ELV Program. The requirements defined in NPD 8610.23A, NPD 8610.24A, and NASA STD 8709.2 have been applied to the various phases of this flow, as appropriate. The matrix in Appendix A reflects the insight and approval levels that are applied to the standard mission flow.



**Figure 1, ELV Major Process Flow**

## **7.0 ORGANIZATIONAL RESPONSIBILITIES**

The ELV Launch Services Project provides the mission management, engineering, analysis, integration, and surveillance and audit efforts necessary to ensure proper implementation of all customer requirements and ELV flight assurance requirements to ensure mission success.

## **8.0 MISSION SPECIFIC IMPLEMENTATION**

Based on the Risk Management Approach described in Section 4.0, and the guidelines of Appendix A, each ELV Project Mission Integration Team (MIT) will develop a Mission Plan for each mission. The plan will include:

- Mission Interfaces
- Mission Integration Schedule and Reviews
- Mission Success Approach including:
  - Verification Matrix
  - Technical Management (Insight & Approval tasks, tailored if required)
  - Orbital Debris
  - Product and Pedigree Reviews
  - Engineering Review Board overview
  - Risk Management overview
- Launch Services
- Launch Site Operation

- Launch Management
- Performance Evaluation

The plan will be produced at the time of Launch Vehicle Service Authority to Proceed (ATP) and will be reviewed and approved by the Mission Integration Manager.

Following launch, the MIT, in conjunction with the Launch Director, will issue a "Lessons Learned" document that outlines how well the process worked for that mission. The "Lessons Learned" document will also delineate any special circumstances or tasks supported for that mission.

## **9.0 EFFECTIVITY**

This PPMI will be effective for all new missions at the point of ATP. Effectivity for missions currently beyond ATP will be phased, and occur upon release of the Mission Plan.

### **APPROVAL**

**//Original Signed By//** \_\_\_\_\_ **Date: 12-05-00**  
**S. M. Francois**  
**ELV and Payload Carriers Programs Office**

### **Attachments:**

**Appendix A - Expendable Launch Vehicles (ELV) Insight and Approval**

## Appendix A - Expendable Launch Vehicles (ELV) Insight and Approval

	NASA Approval	8610.23 Attachment A	8610.24	8709.2	NASA Insight	8610.23 Attachment A	8610.24	8709.2
Mission Design, Integration and Engineering	• Spacecraft to launch vehicle mission requirements, ICD's/Mission Specification	a.1						
	• MIWG minutes and action item resolutions	a.2						
	• Mission unique hardware design and analysis	a.3						
	• Mission-unique software design and analysis	a.4						
	• Mission-unique design and qualification reviews	a.3, a.4						
	• Chair Design Certification Reviews	a.3 a.4		II.1				
Launch Vehicle Design, Production and Test (Core Vehicle Design, Launch Vehicle Production and Test)	• Risk Management and Systems Effectiveness Plan/Approach (See Note 2)	a.5		II.4				
	• Top level test plans, requirements and success criteria for Integrated Vehicle Systems and for tests that verify the integrated vehicle interfaces	a.6		III.10	• Production Program Reviews, plans and schedules	b.2		III.8
	• Mission unique hardware manufacture and test	a.3			• Baseline core vehicle design, analyses, and configuration management	b.1		
	• Mission-unique software test	a.4			• Core Vehicle Design Reviews and Qualification Reviews	b.8		II.1, II.2. II.3.
	• Anomaly resolutions that affect the spacecraft to launch vehicle integrated assembly	a.13			• Major/Critical Problems and Contractor Engineering Board Activities	b.9		II.5. (Note 1)
	• Pre-Vehicle-on-Stand Review	a1, a3, a4, b.2		III.2	• Evaluate adequacy of & attend Change Boards, MRB's, PRB's			II.5, III.5 (Note 1)
					• Production and systems test and Material Review Boards	b.3		III.1.
					• Critical Flight Hardware Pedigree/Hardware Acceptance Reviews	b.4		III.3.
					• Audits of LSP's Safety and Quality Assurance Plans and processes	5.c.(5) b.5		III.7.
					• Changes to Contractors System Effectiveness Plans	b.6		III.4.
					• Pre-ship Reviews	b.7		III.2.
					• Major system and integrated systems tests	b.10		
					• Post Test Data Review	b.11		
					• Anomaly resolutions	b.12		III.6.
					• Failure analysis	b.13		III.6.
					• Vehicle Walkdown Inspection	b.17		
					• Operations and Procedure discipline (Audit)	b.18		III.1
					• Work practices and documentation (ISO) (Audit)	5.c.(5) b.19		III.1
					• In-Plant Surveillance			III.1.
					• Review of other vehicle problems to assess for generic problems, proper corrective action and trending			III.9.

Note 1: All changes are reviewed through pedigree review process, regardless of change classification.  
Note 2: Plan is written during procurement phase. Plan's approach is used throughout.

	NASA Approval	8610.23 Attachment A	8610.24	8709.2	NASA Insight	8610.23 Attachment A	8610.24	8709.2
Launch Site Operations	• Top level test plans, requirements and success criteria for Integrated Vehicle Systems and for tests that verify the integrated vehicle interfaces	a.6			• SFA compliance and spot audits	b.5		IV.2. V.2.
	• Spacecraft handling procedures and deviations	a.9			• Major/critical Problems and Contractor EB's	b.9		V.5. VI.2
	• Integrated spacecraft/vehicle mate, test, and closeout procedures and deviations	a.10			• Major system and integrated systems tests	b.10		IV.1.
	• Integrated spacecraft/vehicle mate, test, and closeout as-run procedures and deviations	a.11			• Post Test Data Reviews	b.11		
	• SC to LV Anomaly resolutions that affect the integrated assembly	a.13			• Anomaly resolutions	b.12		IV.1
	• SC to LV Integration	a.11		V.4	• Failure analysis	b.13		IV.1
					•			
					• Vehicle/ground support equipment procedures	b.14		
					• Launch site support work schedules and plans reviews	b.15		
					• Launch site vehicle preparations and closeout data	b.16		VIII.3
					• Vehicle Walkdown Inspection	b.17		V.1, VIII.3
					• Operations and Procedure discipline review (Surveillance)	b.18		VI.1
					• Participate in Sim flights, Dress Rehearsals, Launch Crew Certs			VI.1
					• Selectively Verify Serial Numbers of Critical Installed Hardware			IV.1.
					• Evaluate the adequacy of Change Boards, MRB's, PRB's			IV.1,V.5 VI.2
Launch Operations	• Integrated Launch Commit Criteria	a.7			• Contractor chaired mission, Launch, and Flight Readiness Reviews	b.20		
	• CDLVRR		1.b.(1)		• Vehicle/Ground Support Equipment Procedures	b.14		
	• Chair FRR and LRR		1.b.(2)	VII.4 (SHIA)	• Flight Assurance Pre-Launch Assessment			VII.2.
	• Closeout of actions from NASA-chaired Mission and Flight Readiness Reviews	a.8		VII.4 (SHIA)	• Vehicle Closeouts	b.17		VIII.3.
	• Launch countdown procedures and deviations that affect the spacecraft to launch vehicle integrated assembly	a.12			• NASA Advisory Team		5.b.(2)	
	• Anomaly resolutions that affect the integrated assembly	a.13			• Anomaly Resolutions	b.12		
	• CoFR		5.d.(2)	VII.3. (SHIA)	• Real Time Data Review			VIII.2.
	• Launch Go/No-Go	a.14	1.b.(4) 5.d.(4)	VIII.1 (SHIA)	• Report Status of failed Hardware at MRR, CDLVRR, IMAR, FRR, LRR			IV.3. V.3 VII.1
	• Launch Contingency Plan		5.d.(3)	VII.5, X.1, X.2				

	NASA Approval	8610.23 Attachment A	8610.24	8709.2	NASA Insight	8610.23 Attachment A	8610.24	8709.2
Post Launch Activities	• Mission success determination				• Post-flight vehicle, tracking, and range data review	b.21, b.11		IX.2, VIII.2
	• Lessons learned and contributions to mission success	7.b		IX.4, IX.5	• Post-flight anomaly investigations/closeouts	b.22		IX.3, X.3